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The impact of structural and landscape features of set-asides on the spiders (Araneae) of the herb layer

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Abstract. We investigated the effects of area, age, vegetation structure and landscape features of set-asides on the spiders of the herb layer. We caught the spiders using a semi-quantitative sweep netting of the herb stratum in 160 sampling plots at 32 set-asides in the northeastern lowland of Brandenburg, Germany, from May through August 2001. We analyzed the data using multiple linear regression. The results revealed the following. 1) Vegetation height was the most influential factor increasing the number of species and individuals of particular araneid species at the set-asides. 2) Vegetation cover had no significant effect on the total number of species, but did affect the abundance of particular araneid and linyphiid species. 3) Time since the set-aside establishment and time since last management had no significant influence on the number of species, the number of individuals of particular species, the number of individuals of the ecological group "preferred habitat type." 4) Different types of vegetation structures were used by spider families and araneid species in different ways; the abundance of some araneids benefited from high (dense or sparse) vegetation, whereas linyphiids only benefited from dense vegetation cover.

Keywords: Arable field, landscape ecology, landscape matrix, vegetation structure

Recently the impact of structural, temporal, and landscape factors on the species composition and, in particular, species richness of the spiders of the herb layer in agrarian landscapes has been intensively discussed. Uetz (1991), Gibson et al. (1992a) and Wise (1993) hypothesized that herb-dwelling spiders would have relatively predictable assemblages based on habitat structure. Furthermore, Gibson et al. (1992b) expected the spiders of the herb layer to depend directly on the structural complexity of the vegetation and thus respond to variation in the plant structure on a narrow, local level. These suggestions were supported by several investigations on the influence of vegetation structure on species composition and abundance of herb-dwelling spiders (Scheidler 1990; Borges & Brown 2001; Ysnel & Canard 2000). Rypstra et al. (1999) emphasized the significance of vegetation configuration for the web-attachment points of the spiders of the herb layer. In addition, Schmidt et al. (2003, 2005, 2008) stressed the particular influence of high vertical vegetation structures in arable fields on the abundance of web-building spiders. Most of these reports described the positive effects of diverse vegetation structure in terms of the benefits of the habitat for spiders as pest predators and the promotion of species diversity i.e., the contribution to nature conservation in the agrarian landscape (Schmidt & Tscharntke 2005a, b).

It is increasingly recognized that, beside the vegetation structure and the age of set-asides themselves, the distribution and size of the surrounding habitat patches can strongly influence the local diversity and abundance of organisms (Dauber et al. 2003; Duelli & Obrist 2003; Jeanneret et al. 2003; van Buskirk & Willi 2004; Tscharntke et al. 2011). Bell et al. (1998), Perner & Malt (2003) and Frank & Reichert (2004) found that species richness and the number of individuals of both ground and herb-dwelling spiders increased with the age of set-asides (abandoned farmland) and field edges, respectively.

Numerous recent studies have examined the impact of the surrounding landscape matrix on the ground-dwelling spiders in arable fields (Schmidt & Tscharntke 2005a, b; Schmidt et al. 2003, 2005, 2008; Öberg et al. 2008). Schmidt-Entling & Döbeli (2009) and Haaland et al. (2011) found that sown wildflower strips enhance the species composition and species richness of spiders in arable fields and along the margins of the fields. However, very few investigations have considered the simultaneous impacts of vegetation structure, spatial and temporal properties of the local habitats and the composition of the surrounding landscape matrix on herb-dwelling spiders (however, see Schmidt-Entling & Döbeli 2009).

In our study we hypothesized that the number of species and individuals of herb-dwelling spiders, the response variables, would benefit from vegetation height and cover of the herb layer at the set-asides. We assumed a positive relation between area and time since establishing the set-asides and the response variables. Further, we hypothesized that the distance of different habitat types would have an increasing or diminishing effect on the number of individuals of particular herb dwelling species depending on their preferred habitat as well as on the number of individuals of the ecological group "dry open habitats".

To check our hypotheses, we simultaneously tested the impacts of spatial and temporal factors on a local scale and the landscape features on herb-dwelling spiders to find the most influential predictors that determine species richness and abundance. Specifically, we tested the impact of the following variables: a) the area of the set-asides; b) the age of the plots and the time since they were last managed; c) the height and cover of the vegetation and d) the distance from the transect to the nearest habitat other than a set-aside on the overall number of species, the number of individuals of particular species and the ecological group "dry open habitats".

METHODS

Study Sites.—The area of investigation was located on the north-eastern lowland of Germany. The study was conducted

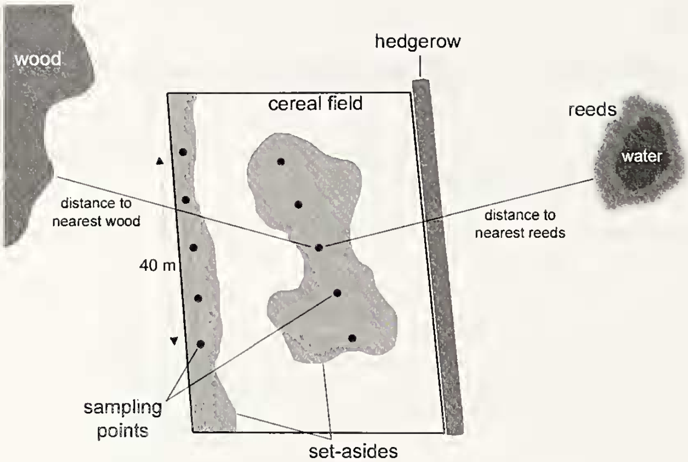

Figure 1.—Sampling design (not scaled) for both the web-spider catches and vegetation surveys. See the text for further explanation.

in northern and southern Uckermark and on the Lebus plate in the Müncheberg area. The young moraine landscape in the Uckermark region is characterized by heterogeneous site conditions. The soils range from very sandy to loamy or partly fen. The fields often contain steep slopes bordered by flat areas or a heterogeneous mix of wet and dry spots. In contrast, the soils of the Müncheberg area are predominantly sandy. In all of these regions, the annual precipitation ranges between 357 and 793 mm/year, the average temperature is 8.8°C [Meteorological station Angermünde and Müncheberg, median values and annual total, respectively, 1973–2002; Federal Ministry of Transport, Building and Urban Development (Deutscher Wetterdienst), 2011, unpublished data].

The farms range from 1,000 to 2,000 ha in area. The average size of the investigated plots (northern Uckermark, 18; southern Uckermark, 6; Müncheberg area, 8) was 2.35 ha ± 2.01 ha. The set-asides were 714 to 3,644 days old; the time since they were last managed up to the last sampling date ranged from 29 to 3,637 days. The management aetivities included mulching and, less frequently, grubbing in the springtime (May or June) and autumn (September or October) to suppress weeds such as thistles. A number of the set-asides were already established in the mid-1990s when the European Union granted subsidies to farmers to set aside parts of their fields to enhance the species richness of the flora and fauna in the agrarian landscape (for details, see Berger et al. 2003, 2006). The detailed data on the spatial and temporal variables are given in Table A1 (see Appendix).

Sampling.—The spiders of the herb layer were caught at a total of 160 sampling points on 32 set-asides within and adjacent to cereal fields. Each of the set-asides was sampled along a 40 m transect situated at the center of the plot. The spiders were caught at five sampling points arranged in a straight line at 10 m intervals (see Fig.1).

Each plot was sampled four times in 2001, during the third week of May, June, July and August, using a semi-quantitative sweep netting procedure (Witsack 1975). The spider collections were performed for 10 minutes at each of the five sampling points within the plot; thus, the total sampling time was 50 minutes on each transect. We surveyed the vegetation structure (measurement of the vegetation height and visually estimation of the percentage vegetation cover) of the herb-, and grass-layer of 10 1x1-m plots at a distance of 1m on both sides of each sampling point (see Figure 1) at each sampling date according to a method of Dierschke (1994). On a landscape scale, we calculated the nearest distances from the adjacent non-set-aside habitat types (arable fields, waters, reeds and woods) to each of the set-aside plots using Geographic Information Systems (GIS) maps (see Figure 1).

Most of the adult spiders were identified in the field with a magnifying glass (10 ×) and then released. *Dictyna arundinacea* (Linnaeus 1758), *Metellina segmentata* (Clerck 1757), *Tetragnatha extensa* (Linnaeus 1758), and all juveniles, linyphiid and theridiid spiders were transferred to jars containing 70% ethanol, transported to the laboratory and identified using Heimer & Nentwig, (1991), Roberts (1985, 1987, 1995), and Wiehle (1956, 1960). The nomenclature follows Platnick (2011). Those spiders that were not identified to the species level, sueh as the juveniles of Salticidae and Thomisidae, are not considered in this report because our statistical analyses were based exclusively on the species data.

Ecological groups.—The term "preferred habitat type" used in this report acts as an ecological group that represents the local distribution of a spider species in the landscape of the federal country of Brandenburg. Each species found in this federal country was assigned to one of 19 defined habitat types or to "unknown (?)" if an unambiguous allocation was not possible (Platen et al. 1991, 1999). The preferred habitat types for each species caught in this investigation are listed in Table 1. The preferred habitat types "fallowland", "dry grassland", and "heather" that are similar in low shading and low moisture were combined to "dry open habitats" and were tested as a combination.

Statistical analyses.—First, the predictor variables vegetation height and vegetation cover per sampling point and each sampling date were averaged for each set-aside. A multiple linear regression (Sokal & Rohlf 1995) was performed to test the hypotheses formulated above. All of the predictors were tested for multiple colinearity. The tolerance and variance inflation factor (VIF) were also calculated. Moreover, the data were tested for autocorrelation with Durbin-Watson statistics. The corresponding procedures are implemented in the program SPSS. The test of the predictor variables for multiple colinearity showed a tolerance between 0.26 and 0.73. The variance inflation factors (VIFs) ranged between 1.4 and 3.8. In general, the borders to reject independence are <0.25 for the tolerance and >5.0 for the VIF, respectively (Urban & Mayerl 2006). The results of the Durbin-Watson statistics ranged from 1.27 to 2.30 (see Table 2). For $N=32$ and $k=10$ the lower limit is $d_L=0.59$, the upper limit $d_U=2.13$ where N is the number of cases and k the number of predictors (Savin & White 1977).

Each of the response variables, i.e. species, the family Linyphiidae and the preferred habitat type were tested independently for significanee in a separate model. All of the variables tested were included in each of the models simultaneously. Before the analyses, the number of individuals of each species was summed over the four sampling periods of the investigation. Only those response variables that showed a significant result for at least one predictor are displayed in Table 2, including the overall number of species, the numbers of individuals of particular araneid and linyphiid

Table 1.—Total numbers of adult and juvenile spider species caught at the set-asides in northeast Brandenburg during four months, with modified habitat preferences according to Platen et al. (1991, 1999).

Species	Number of individuals		Preferred habitat
	Adults	Juveniles	
Aculepeira ceropegia (Walckenaer 1802)	1	277	Agricultural field
Agalanatea redii (Scopoli 1763)	87	0	Fallowland
Araneus diadematus Clerck 1757	25	3	Dry forest
Araneus quadratus Clerck 1757	203	58	Wet grassland
Argiope bruennichi (Scopoli 1772)	91	80	Fallowland
Cyclosa oculata (Walckenaer 1802)	2	8	Fallowland
Cheiracanthium erraticum (Walckenaer 1802)	2	0	Dry grassland
Dictyna arundinacea (Linnaeus 1758)	62	21	Fallowland
Enoplognatha ovata (Clerck 1757)	39	3	Fallowland
Erigone atra Blackwall 1833	2	0	Agricultural field
Floronia bucculenta (Clerck 1757)	71	0	Wet forest
Larinioides cornutus (Clerck 1757)	12	313	Reeds
Larinioides patagiatus (Clerck 1757)	4	0	Dry forest edge
Linyphia triangularis (Clerck 1757)	83	5	Dry forest
Mangora acalypha (Walckenaer 1802)	42	1255	Agricultural field
Metellina segmentata (Clerck 1757)	4	1	Moist forest
Microlinyphia pusilla (Sundevall 1830)	1712	1127	Fallowland
Neoscona adianta (Walckenaer 1802)	1	3	Heather
Phylloneta impressa (L. Koch 1881)	628	936	Fallowland
Pisaura mirabilis (Clerck 1757)	7	36	Fallowland
Selimus vittatus (C.L. Koch 1836)	2	0	Dry forest
Tetragnatha extensa (Linnaeus 1758)	9	92	Reeds
Tibellus oblongus (Walckenaer 1802)	1	15	Fallowland

species, the linyphiid family as a whole and the preferred habitat type "dry open habitats". Each analysis was calculated separately for the abundance of adult and juvenile spiders. As the results for adults and juveniles showed no significant differences, the analyses were only displayed for the developmental stages combined together. Before the analyses, all response variables were logarithmically transformed (log(x+1)) to normalize the distribution and homogenize the variance. The distances from the set-aside plots to different adjacent habitat types up to 1 km from each set-aside were calculated using GIS maps (Ministerium für Umwelt, Naturschutz und Raumordnung 1995, Scale, 1:10,000). The computer programs used were ArcView version 3.3, (ESRI Inc., Redlands, CA, USA), Designer version 4.1 (Micrografx Inc., Richardson, TX, USA), and SPSS version 12 (IBM Inc., Armonk, NY, USA).

Table 2.—Impacts of spatial, temporal and landscape variables on herb-dwelling spiders: Durbin-Watson statistics (D-W stat), R^2, and significance of the whole model (Sign. model). The figures in the predictor lines indicate the standardized coefficients (beta) and the significance levels (* ≤ 0.05, ** ≤ 0.01), respectively. N_{spec} = total number of species, dohs = number of species preferring dry open habitats, Acu_cero = *Aculepeira ceropegia*, Aga_reed = *Agalanatea reedii*, Ara_quad = *Araneus quadratus*, Arg_brue = *Argiope bruennichi*, Mic_pusi = *Microlinyphia pusilla*, Liny_tot = total number of linyphiid individuals, Area = area of set-aside, TSet-aside = time since set-aside, TLastMan = time since last management activities, Vheight = mean (of four sampling dates) of the vegetation height, VCover = mean of vegetation cover, D_field = distance to the nearest arable field, D_wat = distance to the nearest waters, D_reed = distance to the nearest reed, D_hedgerow = distance to the nearest hedgerow, D_wood = distance to the nearest wood. The variables that showed significance slightly above the level of p = 0.05 are given in brackets.

Parameters	Nspec	dohs	Acu_cero	Aga_reed	Ara_quad	Arg_brue	Mic_pusi	Liny_tot
D-W stat	2.12	2.24	2.24	2.30	1.27	2.12	1.83	1.93
R^2	0.53	0.55	0.67	0.66	0.70	0.67	0.57	0.64
Sign. model	0.05	0.04	0.002	0.003	0.001	0.003	0.02	0.006
Area [ha]	0.78, *	0.79, *.	0.83, **	0.59, *	0.16, n.s.	0.91, **	0.17, n.s.	0.28, n.s.
TSet-aside [days]	0.02, n.s.	0.15, n.s.	0.40, n.s.	0.40, n.s.	−0.005, n.s.	−0.15, n.s.	−0.17, n.s.	−0.20, n.s.
TLastMan [days]	0.26, n.s.	0.27, n.s.	−0.20, n.s.	0.39, n.s.	−0.31, n.s.	−0.10, n.s.	−0.08, n.s.	0.02, n.s.
Vheight [cm]	0.53, **	0.13, n.s.	0,47,**	0.07, n.s.	0.68, ***	0.33, *	−0.25, n.s.	−0.20, n.s.
VCover [%]	0.08, n.s.	0.11, n.s.	−0,46,*	−0.10, n.s.	0.36, *	0.54, **	0.36, (*)	0.42, *
D_field [m]	0.02, n.s.	0.12, n.s.	0.06, n.s.	−0.02, n.s.	0.32, (*)	0.39, *	0.22, n.s.	0.30, n.s.
D_waters [m]	0.26, n.s.	0.38, *	0.21, n.s.	0.04, n.s.	0.20, n.s.	0.14, n.s.	0.05, n.s.	0.09, n.s.
D_reed [m]	−0.15, n.s.	−0.23, n.s.	−0,37, *	−0.20, n.s.	0.23, n.s.	0.24, n.s.	−0.52, *	−0.52, **
D_hedgerow [m]	0.21, n.s.	0.16, n.s.	−0.05, n.s.	0.16, n.s.	0.19, n.s.	0.16, n.s.	−0.10, n.s.	−0.11, n.s.
D_wood [m]	−0.56, n.s.	−0.47, n.s.	−0,56, *	−0.40, n.s.	0.27, n.s.	−0.18, n.s.	−0.46, n.s.	−0.53, *

RESULTS

Composition of spider assemblages.—In all, 23 species and 7,323 individuals were identified, including 3,090 adults of 23 species and 4,233 juveniles of 18 species. The adult and juvenile species' abundance and their preferred habitat types are listed in Table 1; the species and ecological group tested, along with the number of individuals of adult and juvenile spiders combined can be found in Table A2.

In accordance with the sampling method used, most of the species belonged to the families Araneidae, Linyphiidae and Theridiidae. The plurality of species (39.1%) were characteristic for fallowland, followed by those species preferring dry forests (including dry forest edges) and arable fields at 17.4% and 13.0%, respectively. The fallowland species contributed 66.3% to the total number of individuals, and three species that preferred arable fields accounted for 21.5%. The ratio of adult to juvenile individuals for the species that prefer arable fields was 1:39.8, while the corresponding ratio for the species that prefer dry open habitats was 1:0.8 (see Table 1).

Variables influencing overall species richness.—The results of the multiple linear regression are presented in Table 2. The most influential factor that significantly increased the total number of species at the set-aside plots was vegetation height (Table 2). In contrast, vegetation cover revealed no significant effect on species richness. Another factor that increased the number of species significantly was the area of the plots. Neither the time since establishment, the time since the last management activities at the set-asides nor the distances to any of the surrounding habitat types showed a significant effect on the number of species.

Variables influencing the number of individuals of particular species and of the ecological group.—The number of species that prefer dry open habitats increased significantly as the distance to waters increased. Vegetation height and cover and temporal factors revealed no significant effects. Area was the most influential factor that significantly increased the number of species of the "dry open habitats" ecological group.

In addition to area, vegetation height was the most influential factor that increased the number of individuals of the araneid species *Aculepeira ceropegia* (Walckenaer 1802), with a high significance on the local scale. However, with increasing vegetation cover, the number of individuals of *A. ceropegia* significantly declined. On the landscape scale, a significant negative relationship was found between the number of individuals of this species and the distance to woods or waters (see Table 2).

The only predictor that signifieantly inereased the number of individuals of *Agalenatea redii* (Scopoli 1763) was the area of the set-aside plots.

Vegetation structure (height and cover) was the most significant predictor increasing the abundance of *Araneus quadratus* Clerck 1757. Neither area nor temporal factors had a significant influence on the abundance of this species. On the landscape scale, the abundance of *A. quadratus* rose with greater distance to arable fields (significance slightly above 0.05).

A significant increase in the abundance of individuals with greater distance to an arable field was also found for *Argiope bruennichi* (Scopoli 1772). On the local scale, the number of individuals of this species increased highly significantly as vegetation cover became more dense, and increased significantly with vegetation height. However, the most influential factor that positively influenced the abundance of this species was the area of the plot.

The number of individuals of the linyphiid family in general and for *Microlinyphia pusilla* (Sundevall 1830) in particular significantly benefited from dense vegetation cover. None of the remaining factors on the local scale had a significant influence on the number of individuals. On the landscape scale there was a strongly significant negative relationship between the distance to reeds and the number of individuals and a significant negative relationship between the distance to woods and the abundance of the linyphiid species as a whole. For *M. pusilla* the same negative relationship was merely significant for the distance to reeds (see Table 2).

DISCUSSION

The total number of species and the number of species that prefer dry open habitats significantly increased with the increasing area of the set-asides. This observation can also be extended to the abundances of most of the araneid species tested, but there was no such significant relationship observed with regard to the linyphiid species in general and *M. pusilla* in particular. These findings imply that larger set-asides may provide more structural diversity for araneid species to meet their different requirements for web building, overwintering and dispersal (Rypstra et al. 1999; Bell et al. 2001). The number of individuals of the much smaller linyphiid species, which build small webs near the ground, appears to depend primarily on the availability of dense vegetation cover and shows no significant relationship with the area of the plots. Nevertheless, this finding supports the more general conclusion of van Buskirk & Willi (2004) whose meta-analysis of studies on the beneficial impact of set-aside areas stressed that spider density increases markedly as the area of the set-aside increases (from 0.002 to 50 ha).

Our findings show that there is no significant relationship between time since the set-aside was established or time since the last management and total number of species or number of individuals of particular species and the preferred habitat type. The corresponding findings of comparable studies are rather inconsistent. Bell et al. (1998) investigated the ground-dwelling spider communities of regenerated disused quarries and found no relationship between the number of species and individuals and the age of the sites. Furthermore, these authors found that the number of species and individuals did not differ between highly managed and unmanaged sites. In contrast, Frank et al. (2009) stressed that the density, biomass and speeies richness of spiders increased as the age of wildflower sites increased from one to four years, and Gibson et al. (1992a) found a net increase of species richness over a sampling time of six years in grazed grasslands. Van Buskirk & Willi (2004) found that the benefit represented by the density of spiders in set-aside areas varied with the number of years since the land was removed from conventional production and showed a strong increase in the first six years since establishment. Tscharntke et al. (2011) demonstrated that the species richness of different animal groups was the highest in two year-old set-aside fields in a sequence from one- to three-year-old set-asides; no further significant increase in the species richness was found in the older set-asides. If we view the conclusions of Tscharntke et al. (2011) as generally accepted, we recognize that significant increases in the species richness and in the number of individuals were unlikely to occur in our study because all of the plots examined had attained or exceeded an age of two years (see Appendix, Table A1).

Our results show that, in addition to area, vegetation structure (height and cover) is the most influential predictor in relation to the benefits, as measured by the total number of species, by linyphiid individuals and by most of the araneids. In conjunction with the findings above, after two years of succession from pioneer to at least ruderal vegetation, there are no further significant changes in the abundance and number of species in the spider communities of the herb layer. Two of the araneid species benefited from both a high and dense vegetation cover, whereas the number of individuals of one species (*Aculepeira ceropegia*) increased with a high vegetation cover but decreased with a dense vegetation cover. However, the number of linyphiid individuals only significantly profited from dense vegetation cover. These results are generally consistent with the findings by Frank et al. (2009) that the number of individuals of spider assemblages was best explained by the vegetation cover. Several authors emphasize the significance of a richly structured vegetation cover for herb-dwelling spiders (Uetz 1991; Robinson 1981). However, a rich structure may occur within both high (Rypstra et al. 1999; Bell et al. 2001) and low vegetation covers (Gibson et al. 1992b; Bell et al. 2001). Moreover, our results demonstrate that the structure is not beneficial for herb dwelling-spiders as a whole but is used by different spider species and families in different ways.

The number of individuals of two of the araneid species caught was positively related to the distance to the adjacent crop habitats. This finding may indicate that the set-asides are not originally colonized from arable fields. This assumption is supported by Hatley et al. (1996), Samu et al. (1999), Schmidt et al. (2005), and Thorbek & Topping (2005) who found that a higher proportion of non-crop habitats in the surrounding landscape was associated with increases in the number of spiders in cereal fields. In summary, our results support those of other empirical studies in agroecosystems (Duelli & Obrist 2003; van Burskirk & Willi 2004) and the theoretical considerations in Hanski (1998) that set-asides may benefit from the proximity of appropriate colonization sources but may also act as a source of colonists for other set-asides and secondarily for the surrounding landscape. Therefore, our results stress the complex effect of the landscape matrix bordering set-asides on the herb-dwelling spider species.

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APPENDIX

Table A1.—Spatial and temporal variables at the plots investigated. Veg Height = vegetation height (mean of four sampling dates), Veg Cover = vegetation cover (mean of four sampling dates), TSet-aside = time since set-aside of the plot, TLastMan = time since the last management activity at the plot, ManFrequ = management frequency from 1999 to 2001. Distances to the nearest adjacent habitat types; 1111 denotes that the habitats were more than 1000 m apart from the set-asides. The plots are named after the nearby villages in northern Uckermark, Fredersdorf (Fr), Gollmitz (Go), Güstow (Gu), Naugarten (Na), Stendell (St), and in southern Uckermark, Passow (Pa), Polßen (Po), Welsickendorf (We), and Zichow (Zi), and the Müncheberg area (Mu). The numbers immediately following "Gu 23" refer to different lots.

Plots	Area [ha]	Veg Height [cm]	Veg Cover [%]	TSet-aside [yrs]	TLast Man [yrs]	Distance to nearest adjacent arable field [m]	Distance to nearest hedgerow [m]	Distance to the nearest waters [m]	Distance to the nearest reed [m]	Distance to the nearest wood [m]
Fr2	2.37	125.0 ± 23.8	98.8 ± 2.5	2.98	2.98	0	0	30	80	1111
Go2	1.57	92.5 ± 27.5	86.3 ± 18.0	1.97	1.85	0	660	255	205	1111
Gu1	0.56	110.0 ± 26.5	96.7 ± 5.8	2.97	1.24	0	30	1111	95	215
Gu2	0.41	120.0 ± 34.6	86.7 ± 5.8	2.97	2.97	0	0	990	17	290
Gu4	0.16	70.0 ± 26.5	90.0 ± 10.0	2.97	0.24	0	0	355	730	0
Gu7	0.11	76.7 ± 25.2	100.0 ± 0	2.97	0.21	0	310	80	120	0
Gu8	0.37	83.3 ± 5.8	93.3 ± 11.5	2.98	1.24	0	0	20	400	340
Gu11	0.92	120.0 ± 16.3	100.0 ± 11.5	2.97	2.97	0	135	150	60	1111
Gu23.1	0.30	130.0 ± 26.5	86.7 ± 11.5	1.98	1.98	110	260	180	110	640
Gu23.2	0.21	82.5 ± 25.0	62.5 ± 18.9	1.97	1.97	100	110	210	510	425
Gu23.3	0.14	46.7 ± 5.8	87.7 ± 4.0	1.97	1.97	150	195	165	495	305
Gu23.4	0.15	100.0 ± 34.6	77.5 ± 28.7	1.97	1.97	150	180	165	360	385
Gu23.5	0.19	66.7 ± 5.8	78.3 ± 10.4	1.98	1.98	175	270	255	315	215
Gu23.6	0.18	53.3 ± 5.8	80.0 ± 0	1.98	1.98	160	175	310	305	245
Gu23.7	0.28	113.3 ± 5.8	95.0 ± 5.0	1.98	1.98	75	170	180	160	490
MuB1	4.58	62.5 ± 20.6	87.5 ± 12.6	9.96	2.17	0	0	0	0	1111
MuB8	4.62	115.0 ± 17.3	100.0 ± 0	9.96	9.96	285	145	60	50	1111
Mu1	4.90	85.0 ± 20.8	57.5 ± 25.0	2.96	2.96	0	185	235	150	1111
Mu3	5.26	65.0 ± 12.9	67.5 ± 22.2	2.96	0.11	30	30	25	0	1111
Mu4	5.60	82.5 ± 28.7	100.0 ± 0	2.96	0.19	0	0	0	0	1111
Mu5	5.54	80.0 ± 36.5	100.0 ± 0	4.96	0.17	0	0	0	20	1111
Mu9	5.22	75.0 ± 34.2	97.5 ± 5.0	3.96	0.80	0	5	120	115	1111
Mu22	4.61	57.5 ± 5.0	75.0 ± 12.9	1.96	1.84	0	260	345	70	1111
Na1	1.10	57.5 ± 9.6	65.0 ± 28.9	1.97	1.91	0	380	655	370	350
Pa1	3.69	100.0 ± 27.1	80.0 ± 16.3	1.98	1.86	0	250	410	1111	1111
Po1	3.24	90.0 ± 24.5	90.0 ± 8.2	2.98	2.98	0	0	0	75	1111
Po3	3.35	100.0 ± 14.1	92.5 ± 5.0	9.98	9.98	0	55	310	120	1111
Po5	3.23	90.0 ± 29.4	70.0 ± 8.2	2.98	2.86	0	30	10	280	1111
St1	3.81	70.0 ± 30.0	63.3 ± 37.9	2.98	2.86	130	500	715	1111	755
St4	3.90	103.3 ± 47.3	76.7 ± 25.2	9.98	1.13	90	0	10	1111	0
We4	2.61	57.5 ± 15.0	92.5 ± 15.0	9.98	1.11	0	215	550	1111	1111
Zi3	2.05	50.0 ± 0	79.5 ± 13.7	1.98	0.08	0	20	50	245	480

Table A2.—Numbers of individuals (sum of five sampling points at each plot over 4 months) of araneid and linyphiid species (adults and juveniles combined) used in analysis and the number of species preferring dry open habitats (dohs) at the investigated plots. See Table A1 and Table 2 for the abbreviations of the plots and species names, respectively.

Plots	Acu_cero	Aga_reed	Ara_quad	Arg_brue	Mic_pusi	Liny_tot	dohs
Fr2	6	3	29	4	108	114	6
Go2			15	3	20	20	5
Gu1	7		17		127	127	4
Gu2	11	1	6	3	62	92	9
Gu4	8		3	2	20	25	5
Gu7			2		213	218	3
Gu8	8				125	130	4
Gu11			1		53	58	4
Gu23.1	7		11	3	78	84	5
Gu23.2	2		4		23	23	4
Gu23.3					121	121	4
Gu23.4	5		6	1	51	51	4
Gu23.5	2		3		253	261	4
Gu23.6			1	4	464	464	4
Gu23.7	1		38	6	83	83	3
MuB1	52	23	2		47	47	6
MuB8	16	19	37	71	40	118	9
Mu1	41	2	1	2	40	42	6
Mu3	15				23	25	5
Mu4	6	1	1	9	100	100	6
Mu5	9		10	7	101	101	4
Mu9	4		5	28	162	163	7
Mu22	35	16	2	6	168	171	6
Na1	6				53	55	4
Pa1	2		53	5	9	12	3
Po1			3		52	52	3
Po3	3	11			46	46	8
Po5	1				43	43	2
St1	5	4	2	2	16	16	8
St4	26	7	2	7	72	72	6
We4			7	8	20	20	4
Zi3					46	46	3